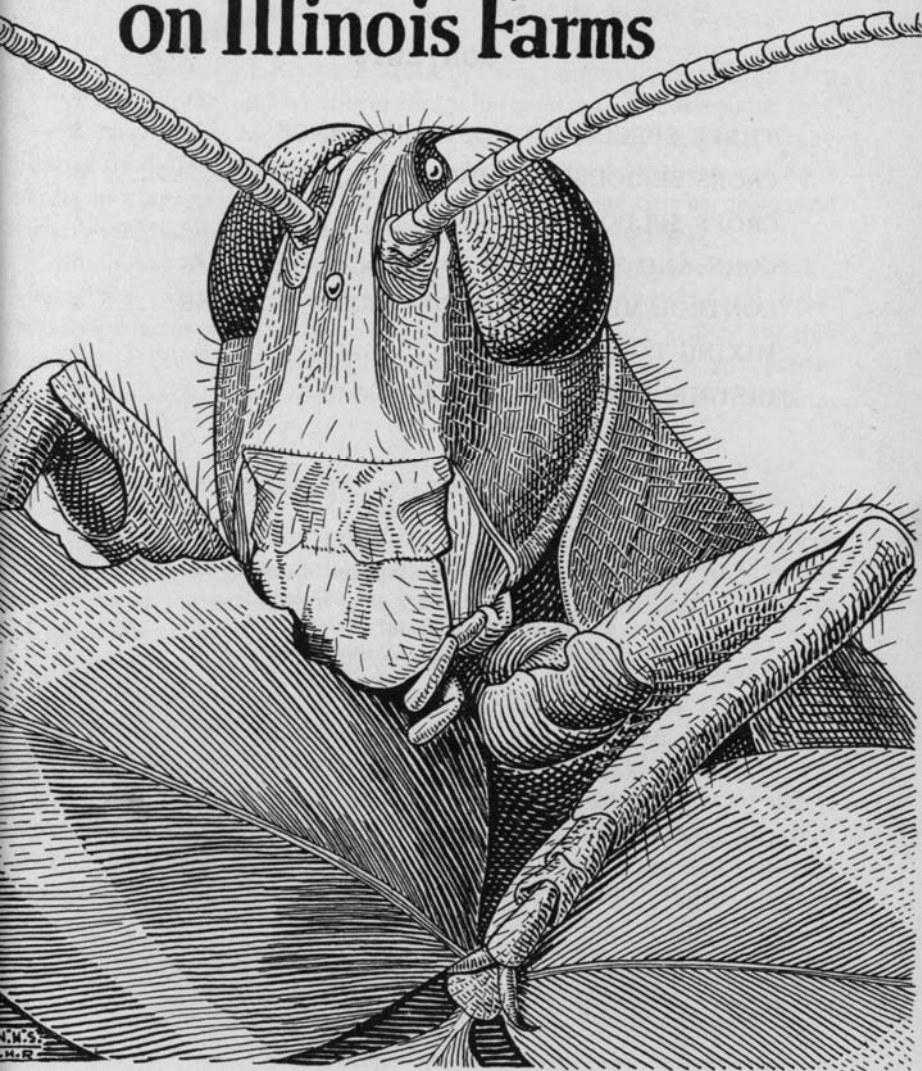


Fighting **Grasshoppers** on Illinois Farms



Circular 466

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In cooperation with Illinois State Natural History Survey

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Fighting Grasshoppers on Illinois Farms

By J. H. BIGGER, W. P. FLINT, and M. D. FARRAR¹

GRASSHOPPERS have again become numerous in a large area of Illinois, and whenever and wherever they are abundant they are to be reckoned with as a serious crop threat. Many millions of dollars worth of crops can be destroyed by these ravenous insects in a very short time, yet most of this damage can be prevented if the young hoppers are poisoned shortly after they hatch.

Illinois has experienced a number of severe grasshopper outbreaks. Among the worst were those starting in 1865, 1874, 1885, and 1917. Grasshoppers usually continue abundant for two to six years. By this time either the insect enemies become numerous enough to destroy most of the hopper eggs or unfavorable weather reduces their numbers.

THREE SPECIES DO MOST OF DAMAGE

Altho many kinds of grasshoppers occur in Illinois, only three species,—the large differential grasshopper,² the lesser migratory grasshopper,³ and the red-legged grasshopper,⁴—are responsible for nearly all the damage.

These three species go thru the winter in the egg stage in the ground. The egg pods contain from 20 to 200 eggs. Most of the eggs are deposited in or around the crowns of grasses or other plants, where the ground is firm. They are very seldom laid on bare ground.

Under Illinois conditions grasshoppers prefer the margins of fields, particularly along fence rows; ditch banks; and ground along the sides of roads, especially out at the edge of the road where the soil has been packed (Fig. 1). They usually prefer south or west slopes for egg

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²*Melanoplus differentialis* Thomas. ³*Melanoplus mexicanus* Sauss or *Melanoplus atlanis* Riley. ⁴*Melanoplus femur-rubrum* DeG.

laying, but this preference is not very marked. The smaller species lay their eggs to a considerable extent over entire pastures and fields, particularly fields of clover and alfalfa. Eggs of the larger species have also been found scattered thruout clover fields but they are not so common there as are the eggs of the smaller species. Foxtail, tickle grass, bluegrass growing in clumps, prairie grass, and many other grasses are laid in indiscriminately.

Grasshopper eggs hatch in late spring from May until nearly thru June. The earlier hatching occurs on sandy soils. The young hoppers,

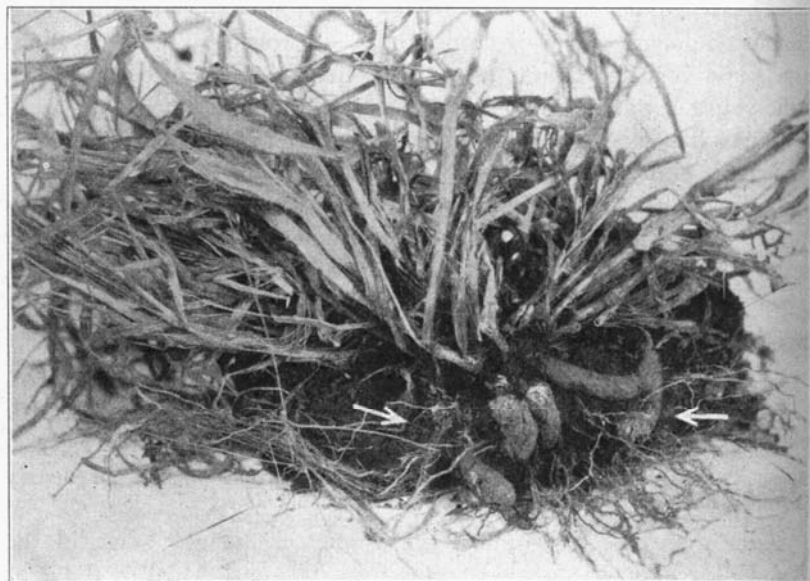


Fig. 1.—A favorite place for egg laying

Note the five egg pods around the crown of this bunch of roadside grass. Each of these pods contains more than 100 eggs, which will hatch in May or June.

when first out of the eggs, resemble the adult hopper except that they are wingless. Their skeleton, as is true of all insects, is external, and as they grow they shed their skins (or skeletons) several times before reaching the adult stage. At the last molt they become winged and fly. Previous to this they can only hop.

Soon after the adult stage is reached, the hoppers begin mating and the females commence to deposit their eggs (Fig. 2).

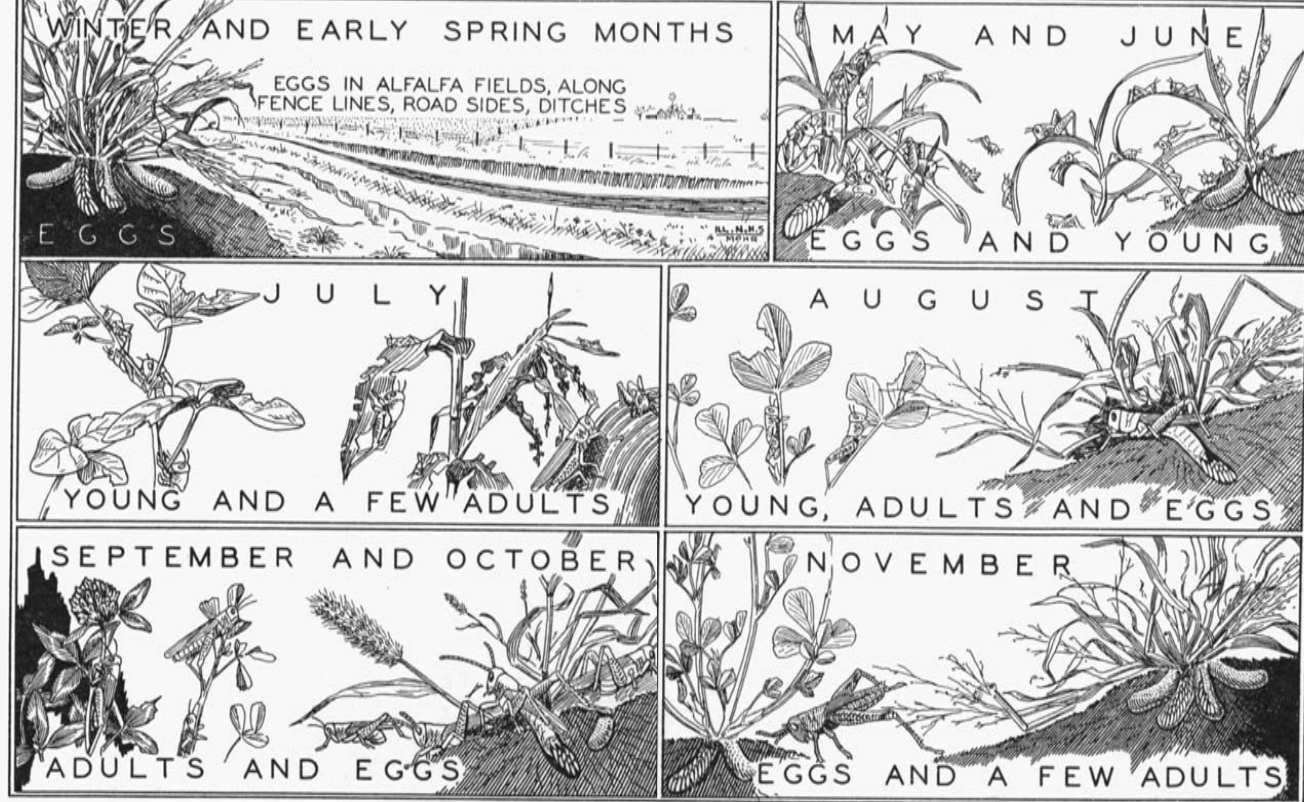


Fig. 2.—Where the grasshopper is found at different seasons of the year

CROPS SERIOUSLY INJURED

Pasture. The primary feeding grounds for injurious grasshopper species are pastures where the egg beds and breeding grounds are located. These pastures are frequently so heavily fed down by the grasshoppers early in the season that their usefulness for livestock is destroyed. Grasshoppers coming from infested pastures also do serious damage to nearby crops.

Forage crops. First-crop alfalfa is usually cut before very serious destruction by grasshoppers occurs. Late alfalfa crops and red clover, however, do not escape when hoppers are abundant. Defoliation may be so complete as to destroy the value of these crops for hay, or the heads of red clover may be eaten to such an extent as to



Fig. 3.—A cornfield stripped by grasshoppers in August, 1936

Hundreds of Illinois fields showed just as severe injury by grasshoppers as this one located on the line between Morgan and Scott counties.

render the crop valueless for seed production. Subsequent grasshopper feeding in such fields frequently causes the death of the plants.

A hopper population of 15 to the square yard, it is estimated, will eat a ton of hay a day from a 40-acre field.

Oats. Oats frequently serve as an intermediate host to the hoppers when their early feeding areas will no longer support them. Leaves and heads are sometimes so extensively eaten that the crop is not worth cutting.

Corn and soybeans. From early-season feeding grounds the grasshopper moves into fields of corn and soybeans. Complete defoliation of these crops is common when the hoppers are present in outbreak proportions (Fig. 3). The attack on cornfields comes about the time of tasseling and silking; and even when the plants are not completely stripped of their leaves, the damage to tassels, and especially silks, may interfere with pollination and cause loss of part of the corn crop.

Garden and truck crops. If these crops happen to be adjacent to breeding or early-season feeding areas, they are frequently completely destroyed or at least severely damaged by the hoppers which move into them in search of food. Tomatoes, sweet corn, peas, beans, and pumpkins may be a complete loss due to feeding by these pests.

Orchards. Young orchards are frequently seriously injured by hoppers. The leaves are eaten off and the bark gnawed. Spraying is of little value. The best defense is poisoned bran bait used in the orchard in the same way as for other crops. Better still, outbreaks of grasshoppers in the vicinity of orchards should be controlled before the insects migrate to the trees.

CROPS SELDOM DAMAGED

Wheat, rye, and barley. Owing either to conditions under which they are seeded or to the fact that they are more nearly mature when the hoppers move into them, wheat, rye, and barley do not suffer so much from grasshopper injury as do some other crops. But under severe infestation even these crops may have the heads destroyed.

Sorghums. Observations show that sorghums are not greatly damaged by grasshoppers under Illinois conditions. On experimental plots where sorghums and corn were interplanted, the corn was sometimes almost completely defoliated, while adjacent rows of sorghums showed negligible amounts of feeding. All varieties of sorghums may not be so resistant.

Sunflowers. Apparently sunflowers are not relished as food by grasshoppers. In areas where corn, soybeans, and other crops were most severely damaged, sunflowers showed very little feeding, at least not enough to cause much commercial loss.

CORN AND SOYBEAN VARIETAL RESISTANCE

Great differences in the attractiveness of several varieties of corn and soybeans to grasshoppers were brought out in the 1936 grasshopper outbreak. In fields where different corn varieties and hybrids were planted in adjacent plots, some were attacked early and completely destroyed before others were eaten to any extent. Whole fields were apparently rejected as feeding areas by the hoppers, while others just as conveniently located were heavily fed upon.

CONTROL MEASURES IN DIFFERENT SEASONS

Late spring poisoning is most effective. The most effective single methods of fighting grasshoppers is poisoning them in the spring while they are still concentrated in large numbers in the vicinity of the egg beds. More than one application of poisoned bait is often necessary (see page 11).

Locate the egg beds, watch them closely in the spring, and shortly after the hoppers begin to hatch, apply the poisoned bait. Examine the area again in 5 to 7 days and if more hoppers have hatched, make another application. By fighting hoppers in this way, only relatively small areas will need poisoning and the hoppers can be killed before they have done any real damage.

Summer control with poisoned bait. Hoppers can be fought in early summer by the continued use of poisoned bait. If earlier poisoning of the hoppers around their egg beds has been neglected, they may be killed with poison during July and early August. The poison should be applied around the margins of the infested areas, as well as to areas where the hoppers are abundant.

Catchers useful in late summer and early fall. Large numbers of hoppers can often be killed under Illinois conditions in the late summer or early fall by the use of hopper "dozers," or catchers.¹ Such devices designed to fit on the front of a truck, tractor, or automobile, or for drawing thru the infested fields, have been used very effectively by many farmers (Fig. 4). The hoppers are killed by falling into the mixture of kerosene and water in the pans of the dozer.

Fall and winter control by plowing and disking. Grasshopper eggs may be destroyed in the late fall or winter by plowing or disking areas where the egg masses have been laid. It is first necessary to go over the fields and surrounding roadsides and find the places where the

¹Plans for constructing hopper "dozers" may be obtained by writing to the department of Agricultural Engineering, University of Illinois, Urbana.

eggs have been deposited—which will usually be close to areas where the hoppers fed most heavily during the late summer.

While this method of destroying grasshoppers is often impractical under Illinois conditions, it is very effective and is decidedly worth using on individual farms where there are egg areas that can readily be treated in this way.

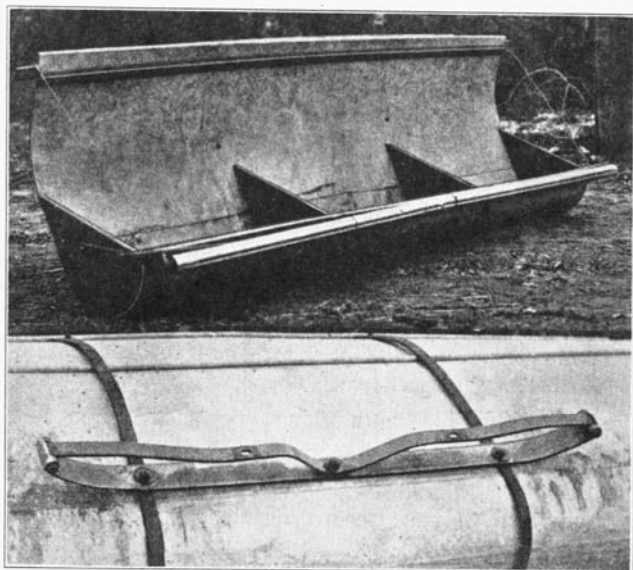


Fig. 4.—A hopper catcher will help to clear an infested field

Attached to the front of a truck, tractor, or automobile, this homemade device will catch many bushels of grasshoppers when used where infestation is heavy. The top picture shows the front view; the lower shows the means of attachment. This catcher was designed and made by A. L. Swanson, Galesburg, Illinois.

MIXING POISONED BAIT

Paris green, white arsenic, sodium pyroarsenate, and sodium fluorid are some of the poisons used in grasshopper bait. In a dry form these chemicals should be used at the rate of 4 pounds in each 100 pounds of bran. In bait containing water, liquid (40 percent) sodium arsenite may be used at the rate of 2 quarts in 100 pounds of bran. Liquid sodium arsenite will not work in an oil bait.

The oil for use in grasshopper bait must be fresh lubricating oil (SAE 20-30). The cheaper grades are suitable. *Do not use fuel oil or waste crankcase oil. Do not use lead arsenate*, as it is not effective.

(1)
Oil bait

Bran.....	100 lbs.
Dry poison.....	4 lbs.
Lubricating oil (SAE 20-30).....	2 gals.

(2)
Wet bait

Bran.....	100 lbs.
Poison (liquid sodium arsenite).....	2 qts.
Water.....	10 gals.

(Sawdust may be substituted weight for weight for as much as half of the bran: bran 50 lbs.; sawdust 50 lbs.)

(3)
Sweetened bait

Bran.....	100 lbs.
Dry or liquid poison.....	4 lbs.
	or 2 qts.
Blackstrap molasses.....	2 gals.
Water.....	8 gals.

(Sawdust may be substituted for one-half of the bran, as in the formula for wet bait.)

Bait can be mixed by hand on an open floor, in a seed-treating machine, or in power machines such as feed mills or concrete mixers. For bait containing dry poisons (powders such as paris green), mix the poison and bran thoroly before adding the oil or the water-and-molasses mixture.

When liquid sodium arsenite is used, it should be added to the water and the poisoned water mixture added to the bran.

A well-prepared bait will have some poison on every particle of bran. Bait containing water may be prepared 48 hours ahead of the time it is to be spread. Oil bait may be mixed several weeks in advance of the time it is to be used and will still be effective.

PRECAUTIONS IN USING POISONED BAIT

In using grasshopper bait, every precaution should be taken to prevent poisoning of man or farm animals.

Clean thoroly and immediately the utensils used in mixing the bait. Avoid inhaling the dust or finely powdered poison.

Be careful not to get any of the liquid poison on hands, face, or other parts of the body. (The hands may be protected by greasing.)

If the bait is scattered in the quantity and by the method directed, there is no danger of poisoning farm animals feeding on the baited areas.

DISTRIBUTING POISONED BAIT

Hand spreading preferred. Hand spreading of bait is preferred under most Illinois conditions. It may be done while walking, or from horseback, or from the back of a moving truck. When endgate oat seeders, tin-horn seeders, or specially designed machinery is used to spread the bait, more is usually applied than is necessary.

Ten pounds of bran (dry weight) to an acre is sufficient for one application. A properly baited area will have uniform distribution of bait over the entire area, in an amount that will be hardly noticeable on the ground. *Poisoned bait should never be put out either in piles or windrows.*

Areas to cover. Roadsides, fence rows, and ditch banks should be watched and the young hoppers poisoned as soon as they appear in May or June. *Killing newly hatched grasshoppers on their egg beds is the cheapest and most effective method of control.*

In alfalfa and clover fields, grasshoppers are usually distributed over the entire field. The most effective and economical baiting is done by leaving narrow strips of the crop uncut thruout the field. The grasshoppers will then leave the cut hay and concentrate in the uncut strips, where they can easily be poisoned.

In corn and soybean fields, feeding generally starts from the edges. Bait should cover the area where the grasshoppers are actually feeding and should extend for several rods beyond the infested area. Where fields of corn or soybeans are adjacent to roadsides or to clover, alfalfa, or small grain fields, several applications of bait at 5- to 7-day intervals may be necessary to kill the hoppers migrating from these areas.

The full effect of a poison application will not be obtained in less than 3 to 7 days.

Time of day to spread poison. The most effective time to spread poisoned bran bait is between midnight and sunrise. Since grasshoppers do most of their feeding early in the morning, soon after sunup, the largest kill will result from fresh bait on the field at this time. Bait applied in late afternoon or evening during hot weather may fail because it dries before morning and is no longer attractive to the hoppers.

CONTROL AT SMALL COST

If grasshoppers are poisoned shortly after they hatch, they may be controlled and nearly all damage from them prevented with little expense. The cost per acre of poisoning, including the poison and labor, will be 30 to 35 cents. If the crop which the hoppers are destroying is near normal value, poisoning will be highly profitable.

The best results from baiting will be obtained if hoppers can be poisoned at about the same time on all farms in a region. This will largely do away with the necessity of later baiting to catch hoppers moving in from other areas.